

We claim:

1. A semiconductor material comprising a plurality of coordinatively irregular structures, said coordinatively irregular structures being in a state of order intermediate between the amorphous and single crystalline phases with the same composition as said coordinatively irregular structures, each of said coordinatively irregular structures having an average thickness ranging from 1 to 5 atomic diameters.

2. The semiconductor material of claim 1, wherein said semiconductor material comprises silicon.

3. The semiconductor material of claim 2, wherein said semiconductor material further includes germanium.

4. The semiconductor material of claim 2, wherein said semiconductor material further includes hydrogen.

5. The semiconductor material of claim 2, wherein said semiconductor material further includes fluorine.

6. The semiconductor material of claim 2, wherein said semiconductor material further includes carbon.

7. The semiconductor material of claim 2, wherein said semiconductor material further includes oxygen.

8. The semiconductor material of claim 2, wherein said semiconductor material further includes nitrogen.

9. The semiconductor material of claim 2, wherein said semiconductor material further includes a dopant.

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10. The semiconductor material of claim 1, wherein said coordinatively irregular structures are disposed in a matrix.

11. The semiconductor material of claim 10, wherein said matrix is of substantially the same composition as said coordinatively irregular structures.

12. The semiconductor material of claim 10, wherein said matrix includes amorphous regions.

13. The semiconductor material of claim 10, wherein said matrix includes microcrystalline regions.

14. The semiconductor material of claim 1, wherein said material is in the form of a thin film.

15. The semiconductor material of claim 14, wherein said thin film is incorporated into a photovoltaic device.

16. The semiconductor material of claim 14, wherein said thin film is incorporated into a diode.

17. The semiconductor material of claim 14, wherein said thin film is incorporated into a transistor.

18. The semiconductor material of claim 14, wherein said thin film is incorporated into a solar cell.

19. The semiconductor material of claim 1, wherein each of said coordinatively irregular structures has an average width ranging from 1 to 5 atomic diameters.

20. The semiconductor material of claim 1, wherein said semiconductor material is porous.

21. A process for making a semiconductor body comprising the steps of:
forming a semiconductor material;

treating said semiconductor material with a plasma of hydrogen, fluorine, or any combination thereof;

repeating said forming and treating steps as needed to produce a desired volume of said semiconductor body.

22. The process of claim 21, wherein said forming step provides a sub-coalescent amount of said semiconductor material.

23. The process of claim 21, wherein said treating step effects formation of coordinatively irregular structures in said semiconductor material, each of said coordinatively irregular structures having an average thickness ranging from 1 to 5 atomic diameters and being in a state of order intermediate between the amorphous and single crystalline phases with the same composition as said coordinatively irregular structures.

24. The process of claim 21, wherein said forming step is accomplished by a technique selected from the group consisting of laser ablation, physical vapor deposition, chemical vapor deposition, plasma enhanced chemical vapor deposition, sputtering, chemical beam epitaxy, atomic layer epitaxy, and molecular beam epitaxy.

25. The process of claim 21, wherein said semiconductor body comprises silicon, germanium or a combination thereof.

26. The process of claim 25, wherein said semiconductor body further includes hydrogen.

27. The process of claim 25, wherein said semiconductor body further includes fluorine.

28. The process of claim 25, wherein said semiconductor body further includes carbon.

29. The process of claim 25, wherein said semiconductor body further includes oxygen.

30. The process of claim 25, wherein said semiconductor body further includes nitrogen.

31. The semiconductor body formed by the process of claim 21.

32. The semiconductor body of claim 31, wherein said semiconductor body comprises silicon, germanium, or a combination thereof.

33. The semiconductor body of claim 32, wherein said semiconductor body further includes hydrogen.

34. The semiconductor body of claim 32, wherein said semiconductor body further includes fluorine.

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